Chapter 4

Summary of Alternatives and Program Components

4.1 Introduction

The Regional Wastewater Services Plan (RWSP) Policy I/IP-2 directs that a report be prepared and submitted to the County Council identifying alternatives and options for I/I reduction and control. This *Alternatives/Options Report* addresses that directive.

To develop the program alternatives and program components discussed below, the County worked collaboratively with the 34 local agencies through numerous meetings with the Metropolitan Water Pollution Abatement Advisory Committee (MWPAAC) and its Engineering and Planning (E&P) Subcommittee. Lessons learned from the pilot projects were also used in developing the alternatives and program components. This is consistent with RWSP Policy I/I-2.3, which requires that the *Alternatives/Options Report* be informed by the results of the pilot projects.

This chapter describes four I/I reduction and control program alternatives that represent a range of choices for future evaluation. They should be viewed as a starting point for further discussion and analyses as a program recommendation is developed in 2005. In addition to the four alternatives, this chapter presents other program components where discussions and analyses are still under way and program components where agreements about direction have been reached. While this chapter presents alternatives and discusses outstanding questions that exist, it does not present the approaches to various components of a regional I/I reduction and control program that were considered and dropped from further consideration. These approaches are discussed in *Appendix A8*.

4.2 Alternatives

To develop a recommended I/I reduction and control program, numerous I/I program approaches need evaluation. This report narrows these approaches into four alternatives. These four alternatives provide a range of I/I reduction and control approaches from which to begin developing a recommended program alternative.

All four alternatives include distinct approaches to addressing core program components. The components include *I/I reduction*, measures of *cost-effectiveness* for I/I reduction projects, and I/I reduction *funding* approaches. I/I reduction refers to the percentage of I/I removed from local agency wastewater collection systems and the regional wastewater conveyance and treatment

system. It is the concept originally presented in RWSP I/IP-2.4. The measure of cost-effectiveness proposed at this point of program development is a benefit-to-cost ratio that compares the cost of I/I repair and rehabilitation projects to the cost of conveyance system improvement (CSI) and treatment plant capacity projects. Cost-effectiveness exists when system-wide benefits (in terms of costs) from construction of I/I reduction projects are less than or equal to the capital and operating costs of conveying and treating I/I flows. The measure can be applied on either a region-wide or a project-specific basis. Future analyses will address the possibility that a local agency contributes funding to make an I/I reduction project cost-effective.

The alternatives below contain either a specific reduction goal or strategies for achieving I/I reduction for the least cost. Note that actual I/I reduction achieved through implementation of any alternative will likely vary from the reduction level projected at the outset. Therefore, it should be expected that the actual I/I reduction level achieved would be established after any alternative is implemented.

The four alternatives and their associated program drivers are described below.

4.2.1 Alternative 1

Driver: Reduce peak I/I by 30 percent in the regional service area from the peak 20-year level.

This alternative reflects RWSP Policy I/IP-2.4, which states "The overall goal for peak I/I reduction in the service area should be thirty percent from the peak twenty-year level identified in the report."

The 30-percent goal is based on information obtained from other jurisdictions around the country during the development of the RWSP. It is not known if the goal is feasible in this region. If Alternative 1 is implemented, cost-effective I/I reduction projects that meet a 1:1 benefit-to-cost ratio would be implemented as a priority. Projects with greater benefits than costs (greater than 1:1; for example, a benefit-to-cost ratio of 2:1 saves two times as much as the cost) would accumulate savings that could be used for constructing additional I/I reduction projects. Once the cost-effective projects are implemented, additional I/I reduction projects, if necessary, would be implemented until the 30-percent reduction goal is met. Cost-effective I/I reduction projects, as well as additional projects that are not cost-effective as may be necessary to achieve the 30-percent reduction goal, would be funded through regional grants

4.2.2 Alternative 2

Driver: Implement I/I reduction projects that are found to be cost-effective based on a *region-wide* evaluation.

This alternative reflects RWSP Policy I/IP-1, which states: "King County is committed to controlling I/I within its regional conveyance system and shall rehabilitate portions of its regional conveyance system to reduce I/I whenever the cost of rehabilitation is less than the

costs of conveying and treating that flow." Implementation of this alternative should cost no more than constructing CSI and treatment plant projects region-wide.

All cost-effective I/I reduction projects with at least a 1:1 benefit-to-cost ratio would be implemented. I/I reduction projects would be funded through regional grants for cost-effective projects. Additionally, local agencies could contribute to bring an I/I reduction project up to the 1:1 benefit-to-cost ratio. Such funding could be from the local agency or from a County low-interest loan. Projects with greater benefits than costs (greater than 1:1; for example, a benefit-to-cost ratio of 2:1 saves two times as much as the cost) accumulate savings that can be used for constructing additional I/I reduction projects. The percent of I/I reduction at peak flow across the entire regional sewer system would be estimated based on the estimated cumulative reduction volumes of all proposed I/I reduction projects.

4.2.3 Alternative 3

Driver: Implement I/I projects that are found to be cost-effective based on a *project-specific* evaluation.

This alternative reflects RWSP Policy I/IP-1, as described in Alternative 2 above. However, it is different, and less expensive, than Alternative 2 because each I/I reduction project would be evaluated for cost-effectiveness based on its own cost savings in comparison to the costs of conveying and treating wastewater flows with higher levels of I/I. Each I/I reduction project would need to meet the 1:1 benefit-to-cost ratio individually. The savings from I/I reduction projects with greater benefits than costs would not fund other I/I reduction projects that are not cost-effective. The methods for estimating and evaluating actual I/I and for funding I/I reduction projects are the same as in Alternative 2. Projects would be funded through regional grants, and local agencies could contribute funding to bring an I/I reduction project up to the 1:1 benefit-to-cost ratio. Such funding could be from the local agency or from a County low-interest loan to the agency.

4.2.4 Alternative 4

Driver: Set a fixed maximum I/I threshold expressed as gallons per acre per day (gpad) at peak flow for each local agency. The maximum threshold would be uniform for each agency that had initial I/I levels exceeding the threshold. However, agencies starting out with I/I levels lower than the maximum threshold, would need to maintain that I/I level with an agreed-upon allowance for pipe degradation over time.

This alternative, which reflects RWSP Policy I/IP-2.4, provides incentives for each agency to meet an established maximum allowable amount of I/I under peak flow conditions. Importantly, local agencies with I/I lower than the established maximum threshold would be required to remain at that lower I/I flow level, with agreed upon allowances for degradation over time. This is because the regional conveyance and treatment system is designed and constructed to convey existing and projected peak I/I flow quantities for those agencies, not the maximum amount allowed by a higher threshold.

Alternative 4 differs from the other three alternatives in that it relies more on regulating the local agencies and less on regional cooperation to reduce I/I levels. It establishes maximum gpad thresholds for each of the local agencies. Because regional system capacity analysis is based on existing I/I 20-year recurrence peak flow rates plus a 7-percent-per-decade flow degradation[1] (with a maximum of 28 percent to occur over 40 years[2]), agencies with I/I levels below the threshold must maintain their existing I/I flow level, including the allowance for degradation. The I/I reduction percentage is based on the percent of I/I reduction region-wide, assuming that each agency contributes either I/I equal to the established maximum threshold or an actual flow amount for those agencies with I/I levels under the threshold. The measure of cost-effectiveness is not applicable to this alternative because the local agencies would be responsible for implementing I/I reduction projects in order to meet the required threshold, including funding of I/I reduction projects or making arrangements with property owners to correct defective private sewer system components that are I/I sources.

Agreement would have to be reached with the local agencies on the level of the gpad thresholds to be established in order to implement this alternative. Extensive monitoring would be necessary to evaluate whether local agencies are meeting their established thresholds. Incentives and/or penalties (such as a surcharge) could be required to attempt to achieve and maintain thresholds over time.

4.3 Other Program Components

In addition to the alternatives discussed above, the County and local agencies (via the E&P Subcommittee) have identified six other program components for a regional I/I reduction and control program. These components include establishing an I/I threshold; inclusion of pre-1961 pipe systems; rates, implementing incentives, and surcharges; addressing private property issues; developing standards, guidelines, procedures, and policies for project investigation, design, construction, and inspection; and educating and involving the public. The following section describes each of these components and discusses outstanding issues currently being evaluated.

4.3.1 I/I Threshold

A peak-flow-period I/I threshold is a maximum allowable level of I/I that should enter the regional treatment and conveyance system during periods of peak flow (typically occurring during storm events). If established, local agencies would be required to meet the I/I threshold.

King County Code, Section 28.84.050 stipulates the sewage disposal rules and regulations for local agencies discharging to the metropolitan sewer system. Currently, Subsection 28.84.050 K.3 defines the flow allowance for groundwater infiltration and stormwater inflow as 3.06 cubic

[1] Degradation is the slow change in a sewer collection system that allows an increase in I/I flows. Degradation is due to cracks in the pipe, pulled joints, connections at manholes, construction damage, traffic damage to manholes, and so forth. For more detailed information, see *Appendix A7*.

[2] The maximum 28-percent degradation figure is a planning assumption. This assumption, like all other planning assumptions, is subject to modification as more experience is gained from I/I reduction projects.

feet per acre times the sewered area in acres. Flow volumes for any 30-minute period that exceed this flow allowance are considered excess flow. Per the contracts between the County and the local agencies, excess flow is subject to an additional charge.

When converted to an equivalent gallons per acre per day (gpad) of I/I, the allowable flow translates to 1,100 gpad. Regional monitoring and modeling indicate that this may be an unrealistically low limit. Whether or not it is realistic, the contract provision has not been enforced. Currently pipes constructed prior to 1961 are exempt from this provision. (The issue of pre-1961 pipes is discussed in Section 4.3.2.)

Establishing a peak-flow-period I/I threshold could be a useful tool for maintaining relatively low I/I levels in the regional system over time because it would provide local agencies with a flow standard to meet. The value of a threshold could be based on the I/I reduction goal ultimately established by the region. Considering the four program alternatives described above, an I/I threshold could be based on flow levels necessary to maintain a 30-percent reduction goal, or a goal established after implementing all identified cost-effective I/I rehabilitation projects, or some other agreed-upon reduction goal. While the potential benefits of an I/I threshold can be easily explained, setting a threshold value and putting it into practice would be more complicated. Currently, the amount of peak-flow-period I/I entering the regional system from specific basins in local agency systems varies from a low of about 1,100 gpad to a high of around 65,000 gpad. This means that the impact of implementing a threshold would not be the same for each agency. Some agencies could be required to make significant repairs and upgrades to their systems while others may actually be operating below an established threshold. This condition also presents an additional complication because the planned capacity of the regional conveyance and treatment system assumes that agencies that have low levels of I/I will maintain those levels (with some allowance for degradation) over time. Establishing a uniform threshold that allows some agencies to increase their I/I flows could actually reduce regional system conveyance and treatment capacity.

Setting and maintaining an I/I threshold is not without costs either. Detailed monitoring of flows within the system would be necessary to measure different agencies' flows in relation to an established threshold. Based on the experience gained in monitoring flows to develop this program, annual flow monitoring costs could be several million dollars per year or more depending on the level of monitoring required.

Discussions with MWPAAC members will continue to address questions about the potential benefits and impacts of establishing an I/I threshold, whether or not a uniform threshold should be established, and what the threshold value(s) should be.

4.3.2 Inclusion of Pre-1961 Pipe Systems in an I/I Program

The regional conveyance and collection system was originally established in 1961 when local agencies signed their contracts with the Municipality of Metropolitan Seattle (Metro) to send their wastewater to Metro's treatment plants. Those original contracts allowed additional fees to be charged for excessive stormwater or groundwater from facilities constructed after 1961. These contract provisions have the effect of exempting sewage collection pipes built before 1961 from

being subject to any standards or fees associated with groundwater or surface water (I/I) entering the system.

Because sewer pipes built before 1961 represent the oldest parts of the system, they are also often a source for high levels of I/I. A question for consideration is whether these older pipes should continue to be treated differently than the newer parts of the system.

Pre-1961 sewer collection pipes exist in nearly all local agency service areas. Given the nature of sewage collection systems, the older pipes exist as segments throughout a system. In other words, it is common for pipes built before and after 1961 to be connected together and wastewater to flow into and out of older and newer pipe as it makes its way through an agency's collection system to the County's regional conveyance and treatment system. Given this physical condition, it may appear that a simple approach to managing, and potentially regulating, I/I flows from local agency systems is to treat all the pipes that make up a system equally because they are all connected together. However, such an approach is not consistent with long-standing contract conditions between local agencies and the County.

The consideration of whether or not pre-1961 pipes should be treated the same as newer pipe relates directly to the potential for establishing a maximum I/I threshold and whether or not a surcharge penalty would be levied for exceedance of that threshold. Surcharge options, which are discussed in more detail in the next section, will need to include consideration of whether or not an exemption for pre-1961 pipe to a threshold and surcharge should be maintained. While maintaining this exemption would be consistent with current contract conditions, it would also pose logistical monitoring problems for isolating flows from newer pipes.

The pipes built prior to 1961 can be significant contributors to regional I/I flows. Therefore, any I/I rehabilitation program that is eventually implemented will include projects to pinpoint leaks in pre-1961 pipes and repair and/or replace those pipes as necessary. However, prior to making any conclusions about the costs or benefits of counting flows from pre-1961 pipe in a regional I/I threshold and surcharge requires further analyses to determine feasibility and to measure the potential costs and benefits.

The pipes that make up the sewer collection system are also being routinely repaired or altered. An additional issue to be considered for this program component is at what point do repairs and alterations to a pipe installed prior to 1961 change its condition to the point that it should be classified as a new pipe.

The County and MWPAAC will be addressing these issues as they work to develop an I/I program recommendation in 2005.

4.3.3 Rates, Incentives, and Surcharges

The RWSP I/IP-2.4 directs that an I/I program recommend target I/I levels and long-term measures to meet the targets: "These measures shall include, but not be limited to…developing an incentive based cost sharing program and establishing a surcharge program." The RWSP further directs that "King County shall consider an I/I surcharge, no later than June 30, 2005 (now 2006), on component agencies that do not meet the adopted target levels for I/I reduction in

local collection systems. The I/I surcharge should be specifically designed to ensure component agency compliance with the adopted target levels. King County shall pursue changes to component agency contracts if necessary or implement other strategies in order to level an I/I surcharge" (RWSP Policy I/IP-3).

While the overall objective of an I/I program would be the reduction of capital costs system-wide and the potential reduction in rates, options for ensuring compliance with I/I standards include whether or not surcharges, incentives, and variable rates should be established. Note that the options identified here are variations of the same thing: ways of charging for non-compliance with I/I reduction and control requirements. Descriptions and discussions of each option are as follows.

- ***Surcharges*** are an additional fee that could be charged to local agencies that discharged more I/I to the regional system than authorized. Essentially, they are local agency fees or penalties for exceeding a predetermined I/I threshold or for causing increased costs related to conveying and treating I/I.
- ***Incentives*** provide financial rewards, in the form of lower rates or rebates, to local agencies that operate at or below an I/I threshold. However, because the funding source for all wastewater treatment system functions is the County's wastewater rate charged to local agencies, funding for incentives would have to be reflected in the County's rate. The practical effect of an incentive program would be that additional fees would be charged to local agencies that exceed a predetermined I/I threshold, similar to a surcharge.
- ***Variable rates*** would establish different rates based on whether or not a local agency meets I/I reduction and control requirements. Variable rates provide both incentives and penalties, and are based on a local agency's I/I contribution. Agencies that have higher I/I levels pay higher rates; those with lower I/I levels pay lower rates. While this approach may provide a financial incentive to reduce I/I flows, it departs from the long-standing practice of charging uniform rates.

Fundamental questions remain between the County and local agencies regarding whether or not surcharges, incentives, or different rate structures would have any positive impact on I/I levels in the regional system. Agencies may find it less expensive to pay a surcharge or higher rates in lieu of paying for I/I improvements. In addition, the revenue generated from surcharges or higher rates may not be enough to pay for I/I rehabilitation projects. The local agencies have suggested that they be allowed to make investments in their own system in lieu of paying surcharges or variable rates.

As is the case with the I/I threshold issue, administration of a surcharge, incentive, or variable rate program would include significant administrative and monitoring costs that would likely be several million dollars per year or more. A portion of the administrative costs would need to cover site investigations to determine if I/I from some sites should actually remain in the wastewater system. An example is the stormwater collected at the County's solid waste transfer stations and directed to the sanitary sewer system. This is done to protect public health because the stormwater has the potential to be exposed to garbage as it travels across transfer station sites.

Questions about whether or not the revenues necessary to cover monitoring and administrative costs would be better spent on I/I repair and rehabilitation projects requires further examination and discussion. More detail about rates, incentives, and surcharges can be found in *Appendix A1*.

4.3.4 Private Property Issues

I/I flow monitoring, modeling, and pilot project data indicate that a significant amount of the total peak flow of I/I in the region is from private property sources.

The cost and potential disruption associated with reducing I/I from private property sources are considerable and affect the ability and willingness of property owners to undertake corrective actions. There are also constraints, including issues of legality and equity, that the County and local agencies must address if public funding is used to defray some or all of the cost of private sewer rehabilitation. For additional detail regarding these issues, see *Appendix A6*.

Inspection of private property to find sources of I/I rests primarily with local agencies that directly provide wastewater collection services to residents and businesses in the region. The local agencies typically have inspection and repair standards within their own regulations that they administer. These standards vary because they were developed independently by each agency.

4.3.5 Standards, Procedures, and Policies

Through numerous meetings, the local agencies and the County developed a working draft of *Standards, Procedures, and Policies* to be used in the pilot projects. They include a mix of standards, procedures, guidelines, and policies for the County and local agencies. Some of the subjects covered are as follows:

- Establishing proper construction practices and materials for I/I repair and rehabilitation projects
- Encouraging appropriate inspection and testing prior to acceptance of new or rehabilitated sections of sewer
- Developing inspection and repair standards for new and existing structures on private property
- Encouraging appropriate system maintenance
- Providing appropriate predesign, investigation of I/I conditions, inspection of construction, and enforcement of standards

These standards, procedures, guidelines, and policies were applied and tested on the pilot projects. From the lessons learned, a final draft version was developed. A more detailed description of the standards, procedures, guidelines, and policies is included in *Appendix A3*. The entire final draft document is included for reference in *Appendix B2*.

Potential benefits derived from requiring uniform standards and procedures for repair and rehabilitation work region-wide may include long-term reductions in I/I volumes and maintenance costs. However, there is not agreement about whether mandatory standards and procedures are necessary to realize these benefits. The County and local agencies continue to discuss whether they should be implemented as requirements region-wide or as a mix of standards and guidelines for the local agencies. There is general agreement that they could be applied uniformly as requirements for I/I repair and rehabilitation projects paid for by County wastewater revenues. However, the local agencies generally believe that they should be used mainly as guidelines for I/I projects and other work that the local agencies would be funding in their respective service areas.

4.3.6 Public Education and Involvement

The pilot projects implemented by the local agencies and the County indicate that property owner participation increases with knowledge about I/I and its impacts on the costs of wastewater conveyance, treatment, and disposal. Participation levels in the pilot projects were also likely influenced by the fact that private property owners benefited from free rehabilitation work on their property. Still, implementation of an I/I reduction and control program, especially one that includes private property and/or rate issues, necessitates some amount of public education and involvement.

The RWSP includes policies for obtaining public input in developing an I/I program (I/IP-2.3). Additionally, the Public Involvement Policies section of the RWSP states the following: “King County shall maintain public information/education programs and engage the public and component agencies of local sewer service in planning, designing and operating decisions that affect them” (PIP-7).

The County and local agencies generally agree that a public education and involvement program is a necessary and beneficial part of any I/I program that is developed and implemented. The role of the County and local agencies in such a program is still open at this time. Several options are still being considered. One option would have the County act as the lead on all regional efforts, while local agencies would be responsible for public education efforts in their service areas. Another approach is to have the County and local agencies work cooperatively to develop and implement both regional and service-area specific education and involvement programs. A third approach would have local agencies take complete responsibility for all public education and involvement efforts. Additional discussion of these options will likely take place later in 2005 as the recommended overall I/I reduction program begins to take shape.

4.4 Program Components with a Single Approach

Three identified program components have clear direction because they are governed by regulation and adopted policy or are based on information gathered through the I/I pilot projects.

They include the regional I/I control program assumptions, the regional I/I control program review period, and environmental review.

4.4.1 Regional I/I Control Program Assumptions

Regional I/I control program assumptions are divided into two categories:

- **Planning assumptions—**used to model future facility needs, including size and timing of new regional sewer system components
- **Reduction assumptions—**used to define I/I reduction project effectiveness, costs, and project design and construction factors

These assumptions are necessary for conducting a detailed cost-effectiveness analyses, which are currently under way and will be completed in the spring of 2005. The assumptions identified here are critical components of a regional I/I reduction and control program evaluation. The County and the E&P Subcommittee collaborated on formulating the assumptions, with the intention that the assumptions meet the following criteria:

- Be reasonable and realistic.
- Appropriately size regional conveyance system facilities and I/I improvements.
- Lead to facilities that meet the Growth Management Act requirement that the regional system be able to convey flows from each local agency concurrent with growth. King County has adopted the additional standard that facilities be sized and timed to provide sufficient capacity to accommodate 20-year peak-flow events.

Following completion of the pilot projects, the County and local agencies (via the E&P Subcommittee) used a collaborative process to discuss and agree on a set of assumptions for the I/I program. The assumptions are being used for conducting cost-effectiveness and I/I removal analyses. These assumptions have been incorporated into a model developed by the County. *The Regional Needs Assessment Report* contains a more detailed discussion of the model and its use in the development of a program recommendation in 2005.

Appendix A4 contains a detailed presentation of the assumptions. Each assumption is listed, and the agreed-to values are shown.

4.4.2 Regional I/I Control Program Review Period

The RWSP indicates that a long-term regional I/I control program necessitates some amount of tracking; specifically flow monitoring and program review. To be manageable and feasible, such monitoring and review (via modeling) need to gauge progress made in I/I reduction and need to occur at certain intervals.

The RWSP is currently expected to be updated every 3 years. The approach for reviewing the I/I program is to review it every other RWSP cycle, or every 6 years. A 6-year review period allows enough time for I/I project design, construction, and post-construction flow monitoring to occur.

4.4.3 Environmental Review

Each proposed I/I rehabilitation or repair project may have environmental impacts in its specific project area; especially if the project area includes streams, steep slopes, wetlands, or other sensitive areas. Therefore, each I/I project will be subject to project-specific environmental review procedures required by the State Environmental Policy Act (SEPA) and other applicable drainage and erosion control standards. Complete environmental review will consider the potential for environmental impacts during both wet (high-flow) and dry (low-flow) seasons. For further discussion and analysis of environmental review, see *Appendix A5*.